

REMARKS

I. Introduction

In view of the above amendments and the following remarks, reconsideration of the rejections contained in the Office Action of April 13, 2009 is respectfully requested.

By this amendment claims 6 and 8 have been amended, claims 1-4 and 9-23 have been cancelled without prejudice or disclaimer to the subject matter contained therein, and claims 24-36 have been added. Claims 5-8 and 24-36 are now pending in the application. No new matter has been added by these amendments.

The specification has been reviewed and revised. No new matter has been added by these revisions. Entry of the specification amendments is thus respectfully requested.

II. Prior Art Rejections

Currently, claims 5-8 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Prahbu et al. (US 6,439,964), claims 7 and 8 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Kakita (US 2003/0077904), and claims 5-8 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Williams (US 6,594,542).

Claim 5 is patentable over Prahbu et al., Kakita, and Williams, whether taken alone or in combination, for the following reasons. Claim 5 requires a polishing method comprising measuring a thickness of a film formed on a substrate; inputting a desired thickness of a film formed on a substrate to be polished; storing polishing rate data on at least one past substrate in a storage device; calculating a polishing rate and an optimal polishing time based on the polishing rate data and the desired thickness by using a weighted average method which weights the

polishing rate data on a lately polished substrate; and polishing a subsequent substrate for the optimal polishing time.

Prahbu et al. discloses a method of controlling a polishing machine which involves generating empirical data on a set of test substrates. On page 2 of the Office Action, the equation shown in column 5, lines 1-5 of Prahbu et al. is asserted as corresponding to the weighted average method required by claim 5. However, the equation of Prahbu et al. solves for the variable $[P_R]_T$, which is the total amount of material removed as a function of radius; in doing so, the polishing time T_i is taken as a variable. (See column 4, lines 65-67.) In contrast, claim 5 requires a step of *calculating a polishing rate and an optimal polishing time* using a weighted average method. Because Prahbu et al. does not disclose calculating a polishing rate and an optimal polishing time using a weighted average method, Prahbu et al. cannot meet the requirements of claim 5. Moreover, the equation of Prahbu et al. is not a *weighted average method which weights the polishing rate data on a lately polished substrate*, as required by claim 5. As is clear from numeral (216) in figure 3, the equation of Prahbu et al. is a summation of a series of polishing steps, not a weighted average. Because Prahbu et al. does not disclose not a weighted average method which weights the polishing rate data on a lately polished substrate, Prahbu et al. cannot meet the requirements of claim 5.

Williams discloses a method for controlling the depth of removal of a material on a semiconductor. On page 3 of the Office Action, the equation shown in lines 48-63 of column 3 of the Williams reference is asserted as corresponding to the weighted average method of claim 5. However, that portion of Williams discloses a well known equation called “Preston’s equation,” which determines the removal rate *as a function of applied pressure and relative velocity*; this equation is not a weighted average method. Because Williams does not disclose a

weighted average method which weights the polishing rate data on a lately polished substrate, Williams cannot meet the requirements of claim 5.

Claim 7 is patentable over Prahbu et al., Kakita, and Williams, whether taken alone or in combination, for the following reasons. Claim 7 require a polishing method comprising measuring a thickness of a film formed on a substrate; inputting a desired thickness of a film formed on a substrate to be polished; storing polishing rate data on at least one past substrate in a storage device; calculating a polishing rate and an optimal polishing time including a margin so as not to excessively polish a subsequent substrate based on the desired thickness and a range of a variation of the polishing rate data; and polishing the subsequent substrate for the optimal polishing time.

On page 2 of the Office Action, it is asserted that column 4, lines 35-47 of Prahbu et al. discloses the margin required by claim 7. That portion of Prahbu et al. explains that an initial profile of a wafer can be determined either by manufacture's specification or independent measurement. There is no discussion of calculating *a margin* so as not to excessively polish a substrate. Moreover, the passage does not involve calculating *a polishing rate and an optimal polishing time*. Because Prahbu et al. does not disclose calculating a polishing rate and an optimal polishing time including a margin, Prahbu et al. cannot meet the requirements of claim 7.

On page 3 of the Office Action, it is asserted that paragraph 0030 of the Kakita references discloses the margin required by claim 7. However, Kakita discloses that “After the completion of polishing (step 205), a wafer rinsing is conducted, followed by measurement of thickness after polishing (step 206). The latest polishing rate is calculated from the measurement result... The resultant latest polishing rate is used when determining an optimum recipe for the next lot. Then, it is determined whether or not the thickness after polishing is within a reference range (step

208), and the history resulting from this determination is stored in a prescribed unit.” (See lines 19-28 of paragraph 0030, emphasis added.) In other words, this portion of Kakita discloses determining an optimum recipe for future substrates based on the latest calculated polishing rate. There is no disclosure of calculating a polishing rate and optimal polishing time *including a margin*. Kakita does disclose the determination of a range, however this is a reference range which is compared against a measurement of the wafer; it is not a calculated margin as required by claim 7. Moreover, the determination of whether the wafer falls within the reference range is made *after* the optimum recipe for the next lot has been determined, and there is no disclosure of the reference range being used in the recipe for the next lot of wafers. In contrast, claim 7 requires *calculating* a polishing rate and an optimal polishing time *including a margin* so as not to excessively polish *a subsequent substrate*. Because Kakita does not disclose calculating a polishing rate and an optimal polishing time including a margin so as not to excessively polish a subsequent substrate, Kakita cannot meet the requirements of claim 7.

Lastly, on page 3 of the Office Action, it is asserted that column 4, lines 25-33 of the Williams reference discloses the margin required by claim 7. That portion of the Williams reference discusses statistical algorithm using analysis and prediction of current and future removal rates; however, Williams does not disclose calculating a polishing rate and an optimal polishing time *including a margin*. In other words, Williams appears to disclose predicting a future removal rate in a wafer polishing process, but does not make any disclosure of calculating a margin so as not to excessively polish a substrate. Because Williams does not disclose calculating a polishing rate and an optimal polishing time including a margin so as not to excessively polish a subsequent substrate, Williams cannot meet the requirements of claim 7.

It is thus submitted that the invention of the present application, as defined in claims 5 and 7, is not anticipated nor rendered obvious by the prior art, and yields significant advantages over the prior art. Allowance is respectfully requested.

Claims 6 and 24-26 depend, directly or indirectly, from claim 5 and are thus allowable for at least the reasons set forth above in support of claim 5. Claims 8 and 28-29 depend, directly or indirectly, from claim 7 and are thus allowable for at least the reasons set forth above in support of claim 7. Claim 31 requires limitations substantially similar to the above-discussed requirements of claim 5, and is thus allowable for at least the reasons set forth above in support of claim 5. Claims 32-36 depend from claim 31 and are thus allowable at least by virtue of their dependencies.

In view of the foregoing amendments and remarks, inasmuch as all of the outstanding issues have been addressed, Applicants respectfully submit that the present application is now in condition for allowance, and action to such effect is earnestly solicited. Should any issues remain after consideration of the response, however, the Examiner is invited to telephone the undersigned at the Examiner's convenience.

Respectfully submitted,

Tatsuya SASAKI et al.

By /Andrew D. St.Clair
Andrew D. St.Clair
Registration No. 58,739
Attorney for Applicants

ADS/rgf
Washington, D.C. 20005-1503
Telephone (202) 721-8200
Facsimile (202) 721-8250
September 14, 2009

Digitally signed by /Andrew D. St.Clair/
DN: cn=/Andrew D. St.Clair/, o, ou,
email=astclair@wenderoth.com, c=US
Date: 2009.09.14 15:46:59 -04'00'